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ABSTRACT

A study compared the pharmacology training of nurse practitioner programs with medical and dental programs. Seventy-three schools in 14 states (40 nurse practitioner programs, 19 schools of medicine, and 14 schools of dentistry) were surveyed by mailed questionnaire about the number of hours devoted to the study of pharmacology. The major findings were that significant differences exist among the three school types on instructional hours spent on basic pharmacological principles, central nervous system depressants and stimulants, psychopharmacology, drug effects on the nervous system, cardiovascular agents, endocrine agents, chemotherapy, and poisons and antidotes. In most cases, medical schools spent more time in these areas than either dental or nurse practitioner programs, and dental schools often spent more time than nurse practitioner programs. No statistically significant differences were found among the three schools in ocular pharmacology, respiratory and gastrointestinal tract agents, and drug interactions. The study concluded that if nurse practitioners are to become independent professionals, they need the right to prescribe medications, and that if they are going to exercise that right, nurse practitioner programs must increase both total hours and various content areas in pharmacology. (KC)

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NURSE PRACTITIONER PHARMACOLOGY EDUCATION

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Abstract

The present study was designed to compare the pharmacology training of nurse practitioner programs with medical and dental programs. Seventy-three schools in 14 states were selected for the study. This sample was composed of 40 nurse practitioner programs, 19 schools of medicine and 14 schools of dentistry. The major findings were: (1) Significant differences were found among the three school types on didactic hours spent on basic pharmacological principles, central nervous system depressants and stimulants, psychopharmacology, drug effects on the nervous system, cardiovascular agent , endocrine agents, chemotherapy and poisons and antidotes. (2) No statistically significant differences were found among the three schools in ocular pharmacology, respiratory and gastrointestinal tract agents and drug interactions.

NURSE PRACTITIONER PHARMACOLOGY EDUCATION

Alex Waigandt and Jane Chang

Introduction

In recent years, a shortage in medical manpower, an uneven distribution of health care services and an increase in medical care costs have caused our health care system to turn its attention to nursing as a sensible method of solving some of its delivery problems. The history of nursing evolved around the changing needs of society and the health care delivery system. Advances in nursing knowledge, increased opportunities for graduate study, consumer acceptance of specialization in nursing, and the feminist movement have enabled nurses to work in diverse settings and contribute in a larger capacity to health care delivery (Durham and Hardin, 1985).

Mauksch's (1978) review of the literature showed that nurses fulfill important roles in health care delivery. She found that 75-80 percent of primary care requests can be met by a trained nurse practitioner. The nurse practitioner is a registered nurse who receives additional education which prepares them to practice in primary care settings. The literature also contains numerous articles describing nurse practitioners' work in a variety of settings accompanied by both consumer and worker satisfaction. (Lewis and Resnik, 1967; Kinlein, 1972; Martin, 1972; Schulman and Wood, 1972; Kelly, 1973; Brandner, 1974; Bibb, 1979; Williams, 1978; Repicky, Mendenhall and Neville, 1980; Manber, 1985; Diehl, 1986; Griffin, Peterson and Brower, 1986; Pearson, 1986.)

A survey of the professional literature reveals that the prescription privileges of nurse practitioners is becoming an important issue in nursing's expanding role. It is clear that medicine and nursing have common goals, the preservation and restoration of health. Yet their roles in achieving these goals are not identical and may be considered as complementary disciplines, each with its own content but sharing a common ground. Bullough (1983) stated that "the trend to consider nurses in the law as persons who prescribe and/or dispense drugs is a recent one. The first state to address the issue was Idaho" (p.462). Since then, nurse practitioners have steadily sought the prescription privilege (Tarmina, 1982; Baker, 1981; State Legislative Report, 1985). In 1981, Baker reported that "since 1971 nurses in at least 30 states have been attempting to rewrite or modify their nursing practice acts to permit full application of the expanded knowledge of nurse practitioners to patient care. Securing the right to prescribe and regulate medication has been part of this process" (p. 420). To date, the following 19 states allow nurse practitioners to write prescriptions: Alaska, Arizona, Idaho, Maine, Maryland, Massachusetts, Michigan, Mississippi, Nevada, New Hampshire, New Mexico, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Vermont and Washington.

It should be noted, however, that most states have very stringent regulations regarding nurses' prescription writing powers. LaBar (1986) reviewed prescription regulations and nurse practitioners. Nurses who apply for the prescriptive privilege must have their credentials approved by the board of nursing or some other state regulatory body. Some states

require authorization from the pharmacy board (ie. Nevada) while others grant approval through the board of medicine (ie. Maine, Oregon). In some states (New Mexico, New Hampshire and Vermont) nurse practitioners do not need special approval but prescribing protocols and a practice agreement between the nurse practitioner and a physician must be filed with the nursing board. Some states (ie. Arizona, Nevada) require a specific amount of pharmacology training hours, usually 30. Others (Oregon, Washington) require a year of clinical practical experience before the NP can apply for prescribing authority. Despite these regulations nurse practitioners have continued to seek authorization.

Prescriptive authority enables nurse practitioners to delivery holistic and cost effective health care. Kjervik (1985) reported that many states allow nurse practitioners to prescribe drugs under protocol or standing order. Her research suggests that in dealing with prescriptive authority, the question of what educational preparation a nurse practitioner needs to prescribe drugs should be asked. Nurse practitioners are gradually gaining the prescriptive privilege, therefore a study to analyze their pharmacology training is appropriate. This study was designed to investigate the educational preparation of nurse practitioners in pharmacology and compare those data with existing data relative to other health professionals legally allowed to utilize drugs in practice.

Methods

In 1985, Waigandt compared the pharmacology training of medical and dental schools in 14 selected states. These states were: Alabama,

California, Illinois, Indiana, Massachusetts, Michigan, Missouri, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee and Texas. Delimiting data collection to these states, in 1986, a random sample of 75 nurse practitioner programs were sent the study instrument and the results were added to the existing data. The department chairperson or director of pharmacology in each school was identified as the study respondent.

Data were generated from the subjects' responses to an instrument whose purpose was to query the amount of hours devoted to the study of pharmacology. The investigation being descriptive in nature viewed hours spent in each of 13 major pharmacology study categories and total class hours in the study of pharmacology as separate dependent variables. These categories included: (1) basic principles in pharmacology, (2) drug effects on the nervous system, (3) psychopharmacology, (4) central nervous system stimulant and depressants, (5) anesthetics, (6) cardiovascular agents, (7) ocular pharmacology, (8) respiratory and gastrointestinal tract agents, (9) endocrine pharmacology, (10) chemotherapy, (11) poisons and antidotes, (12) drug interactions and (13) prescription writing. A 14th variable involved the total hours each school type spent on the study of pharmacology. This instrument was designed through a review of the literature (Goth, 1981) and with the consultation of experts in the field; and, indicative of a pharmacology education sequence for health practitioners.

Results from the instrument were analyzed using the statistical package for the social sciences (SPSSx) and calculated at the University of Missouri. Treatment of the data were performed implementing: (1) descriptive tables utilized to analyze the demographic data, (2) means,

standard deviations and analysis of variance (ANOVA) to analyze the major pharmacology study categories and (3) post hoc analyses (Scheffe procedure) on the major pharmacology study categories whose F-ratio indicated significant differences. The .01 alpha level was selected for statistical significance.

RESULTS

Overall, data were collected from 73 institutions. The sample consisted of 40 nurse practitioner programs (53% response rate), 19 medical schools, (51.3% response rate) and 14 dental schools (45.2% response rate) (Table 1). The results of the pharmacology study questionnaire in terms of mean responses and post hoc analyses among the study groups in each of the 14 categories are presented in Table 2. Table 2 presents means, standard deviations and analysis of variance of classroom hours spent on major pharmacological study categories for the school types.

Study Categories Where Significant Differences Exist

Utilizing ANOVA and post hoc analyses, significant differences were found among school types in eleven categories:

1. basic principles in pharmacology
2. drug effects on nervous system
3. psychopharmacology
4. CNS stimulants and depressants
5. anesthetics

6. cardiovascular agents

7. endocrine pharmacology

8. chemotherapy

9. poisons and antidotes

10. prescription writing

11. total hours in pharmacology training

(see Table 2)

The results of the ANOVA (F=62.66) and post hoc analysis indicated that nursing programs spent less time teaching basic principles in pharmacology than both medical and dental schools. Further, medical schools spent more time on this category than schools of dentistry. Significant differences were also found with the categories, drug effects on the nervous system, cardiovascular agents and chemotherapy. NP programs utilized the least number of hours and medical schools the most.

Significance (F=42.73; p.<.01) was found for class hours spent studying psychopharmacology. Although no differences existed between medical and dental schools, nurse practitioner programs devoted fewer hours than the other school types. These findings were consistent with the categories, CNS stimulants and depressants, and prescription writing. Nurse practitioner programs spent less hours than the other programs compared but no significant differences existed between medical and dental schools.

An F-ratio of 85.41 indicated that significant differences existed among the school types in the study of anesthetics. Scheffe' post hoc analysis showed that NP programs treated this category with

significantly fewer hours than medical schools. Medical schools, however, spent fewer didactic hours on this category than dental schools. Anesthetics continue to be a mainstay in the practice of dentistry since many of the complex operative procedures would be impossible without them.

No significant differences existed between nurse practitioner and dental programs on endocrine pharmacology, however, both programs spent less time on this category than medical schools. The same results were found in the category of poisons and antidotes.

The results of the ANOVA indicated that there was a statistically significant difference among the three school types in overall training hours. ($F = 164.8$, $p. < .001$). This implies that at least two school types are different in total pharmacology training hours. The results of the post hoc analysis indicated that nurse practitioner programs devoted fewer hours than dental schools and medical school spent more time training their students pharmacology than dental schools did (Figure 1).

With respect to total hours in pharmacology training a question that arises is: do nurse practitioner programs in states where NPs have the prescriptive authority differ from programs in states where the privilege currently does not exist? In order to respond to this question, an additional analysis was conducted. Five of the states analyzed in this study have given nurse practitioners prescriptive authority. Thirteen programs from these states were available for analysis. The remaining nine states in this study (27 programs) do not allow NPs prescriptive

privilege. With means (and standard deviations), in terms of hours, of 24.46 (13.11) and 21.37 (11.24) respectively, the analysis revealed that, of the programs selected for this study, no significant differences ($t=0.77$, $df=38$, $p.=0.445$, n.s.) existed in pharmacology training.

Study Categories Where No Statistical Differences Exist

No significant differences were found among school types on the following categories:

1. ocular pharmacology
2. respiratory and GI tract agents
3. drug interactions

(see Table 2)

The analysis of variance conducted on responses to the categories ocular pharmacology, respiratory and GI tract agents and drug interactions indicated that nurse practitioner programs, medical and dental schools were not significantly different in terms of hours spent teaching in these areas. One reason that significance was not found with ocular pharmacology may have been because the three school types spent little time in this category with the schools spending between 45 minutes to one hour. Likewise, with the category, drug interactions. (The grand mean is only 1.38 hours.)

Miscellaneous Pharmacology Training Hours

Nurse practitioner programs were requested to report any pharmacology training not covered in the instrument. Those data were included in the total hours category for analysis. Of the 40 NP programs

13 indicated miscellaneous training hours. Seven of the 13 programs reported hours only and did not address specific content areas. The remaining six indicated the hours and specific content areas: five hours for gynecology management, four to nine hours for contraceptive management, two to five hours for geriatric pharmacology and two to three hours for dermatology drugs.

Conclusions

The first speciality activated in nurse practitioner practice was pediatrics in 1965. Since then a great deal in this discipline has changed. The trend in education is toward more extensive training. Acquiring more education and higher degrees have made a major impact in the service level of the discipline. In the programs studied (75%) award master's degrees to nurse practitioners upon graduation.

Being able to prescribe drugs enables nurse practitioners to offer holistic, cost-effective care to their patients. In light of rising health care costs, the public clearly benefits from nursing's capabilities to take a larger and more responsible role in health care delivery (Eccard (1986). In 1983, the staff of the journal, Nurse Practitioner surveyed 600 NPs with regard to professional activities. According to the survey, there has been an increase in the services related to women's health care, pediatrics and geriatrics. The survey also requested responses to the most common clinical problems seen by nurse practitioners. The ten most common clinical problems responded to by NPs were: URIs (urinary tract infection), hypertension, vaginitis, family planning, UTI (urinary tract infection), skin

problems, diabetes, otitis media, pregnancy/prenatal care, and GI. Other major areas treated by NPs in this survey included: sexually transmitted diseases, obesity, muscular-skeletal problems, heart problems, arthritis, pulmonary problems, lower respiratory infections, depression/anxiety, health maintenance, minor trauma and injuries, general gynecological, well-child care , low back pain, other mental health problems, and postnatal care. Many of these conditions call for the utilization of drugs in their treatment.

Competent drug prescription is a worthy goal for nurse practitioners. Dirubbo states, "It seems clear that the two most important elements for autonomous nurse practitioner practice are supportive laws on prescriptive privileges and direct third-party reimbursement" (cited in Pearson, 1986, p. 58). Though certification, education and experience are factors considered in third-party reimbursement, LaBar stated that in implementing the third-party reimbursement legislation, "...some further specify that only those services currently reimbursable when provided by a physician are reimbursable when provided by a nurse" (1983, p. 9). From this it can be deduced that nurse practitioners will have a better chance for third-party reimbursement when they gain drug prescribing privileges.

Besides the issue of third-party reimbursement there is another concern for nurse practitioners, that of liability. Eccard (1986) suggested that as advanced-licensed nurses perform more independently in complicated medical problems, their actions will provoke increased judicial scrutiny. It is clear that as nurse practitioners become more autonomous in their practice, they will also be subject to an increase in malpractice judgement. It is therefore imperative that nurse

practitioners receive sound pharmacology education and continue to update their drug knowledge to maintain a maximum competency level.

Working within the limitations of this study and based upon its data analysis, the following observations are made with an aim toward promoting nursing research, education and practice. Since pharmacology content varies widely among programs. planners should carefully scrutinize pharmacology training. It seems likely that, although nurse practitioners have been reported to exercise prescriptive authority with competency (Munroe, etal., 1982; Rosenaur, etal., 1984; Holland, etal., 1985), the pharmacology content of most programs should be increased. Based upon the results of this study, specific areas for additional training should include: basic principles in pharmacology (drug metabolism, pharmacokinetics, drug safety and effectiveness), effects on the nervous system (cholinergic and adrenergic drugs, antihypertensives, antihistaminic drugs), psychopharmacology (antidepressant and antianxiety drugs), CNS stimulants and depressants (hypnotics, anti-inflammatory and antiepileptic drugs), anesthetics (pharmacology of anesthesia), cardiovascular drugs (anticoagulant, antianginal, antiarrhythmic drugs, diuretics), endocrine pharmacology (adrenal steroids, vitamins, insulin), chemotherapy (antibiotics, antiseptics and disinfectants, sulfonomides) and poisons and antidotes.

Another concern regarding pharmacology training in nurse practitioner programs has to do with variables related to the quality and intensity of the pharmacology training. NP programs must endeavor to provide instruction equivalent to that in medical and dental programs. Instructors

who teach pharmacology in nurse practitioner programs should have their major educational preparation in the field of pharmacology.

If NP programs provide quality instruction and adequate content, clinicians should have the right to utilize pharmacology in their practice. Competent use of drugs by nurse practitioners can result in better utilization of this nation's health care delivery system as well as an enormous savings of health care dollars.

Table 1

States Surveyed and Schools Reflected in the Research Data.

State	Number of Schools Responding		
	Nursing*	Medical	Dental
Alabama	2	2	1
California	11	3	1
Illinois	2	2	1
Indiana	1	1	0
Massachusetts	5	0	0
Michigan	2	1	1
Missouri	1	0	0
New York	6	2	1
Ohio	1	2	2
Oklahoma	1	1	1
Oregon	2	0	1
Pennsylvania	3	2	3
Tennessee	1	2	0
Texas	2	1	2
Total	40	19	14

*refers to the nurse practitioner programs listed in DHHS Publication OM 200638.

Table 2: Nurse Practitioner Programs, Medical and Dental Schools: Means, Standard Deviations and Analysis of Variance (ANOVA) of Didactic Class Hours Spent on Major Pharmacology Study Categories.

Category	Nursing N=40 Mean (SD)	Medical N=19 Mean (SD)	Dental N=14 Mean (SD)	Grand Mean (SD)	F-ratio	Significance
1 Basic Principles in Pharmacology	2.38 (1.93)	10.56 (3.75)	7.07 (2.95)	5.41 (4.45)	62.66	*
2 Drug Effects on Nervous System	2.43 (1.99)	16.25 (4.76)	10.57 (3.72)	7.59 (6.83)	123.64	*
3 Psyho-pharmacology	1.34 (1.28)	5.47 (2.52)	4.00 (1.80)	2.92 (2.46)	42.73	*
4 CNS Stimulants and Depressants	2.05 (1.69)	9.89 (4.22)	8.57 (3.20)	5.34 (4.62)	60.45	*
5 Anesthetics	0.33 (0.61)	4.05 (1.93)	6.29 (2.73)	2.44 (2.92)	85.14	*
6 Cardiovascular Agents	2.40 (1.88)	12.26 (3.00)	7.64 (3.84)	5.97 (4.99)	92.87	*
7 Ocular Pharmacology	0.46 (0.77)	0.63 (0.90)	0.57 (0.65)	0.52 (0.78)	0.35	n.s.
8 Respiratory and GI Tract Agents	2.12 (1.96)	3.26 (1.66)	2.29 (2.02)	2.45 (1.93)	2.40	n.s.
9 Endocrine Pharmacology	2.46 (2.17)	7.26 (3.26)	4.14 (2.51)	4.03 (3.24)	22.77	*
10 Chemotherapy	2.29 (1.66)	14.05 (5.50)	8.64 (4.24)	6.57 (6.17)	73.37	*
11 Poisons and Antidotes	0.39 (0.57)	3.32 (2.56)	1.36 (1.22)	1.34 (1.90)	25.78	*
12 Drug Interactions	1.21 (1.66)	1.47 (0.70)	1.71 (0.99)	1.38 (1.36)	0.77	n.s.
13 Prescription Writing	0.66 (0.72)	1.11 (0.87)	1.64 (1.15)	0.96 (0.93)	7.22	*
Total Hours in Pharmacology**	22.38 (11.80)	93.15 (15.56)	65.29 (19.40)	49.03 (39.11)	164.83	*

*Significant Differences Among Groups. The critical value .99F2,70 = 4.95; *p<.01
n.s. denotes nonsignificant differences
**Total includes miscellaneous hours not listed in this table

Figure 1--Average Total Pharmacology Class Hours by Program Type

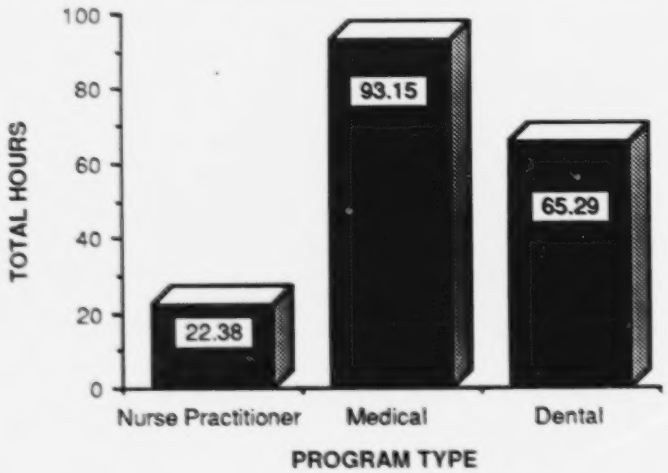
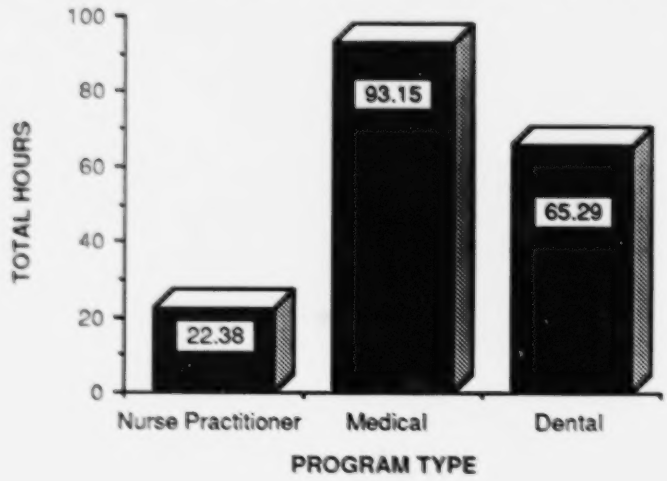


Figure 1--Average Total Pharmacology Class Hours by Program Type



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